

LISTING OF CLAIMS

Claims 25-27 have been amended by this amendment under 37 CFR §1.116.

This listing of claims will replace all prior versions, and listings of claims in the application:

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- E1
1. (Previously Amended) A speech synthesizing apparatus comprising:
storage means for storing plural items of phoneme data;
retrieval means for retrieving phoneme data, in accordance with given retrieval conditions, from the plural items of phoneme data stored in said storage means;
first penalty assigning means for assigning a penalty that is based upon an attribute value to each item of phoneme data retrieved by said retrieval means; and
selection means for selecting, from the phoneme data retrieved by said retrieval means, and based upon the penalty assigned by said first penalty assigning means, phoneme data to be employed in synthesis of a speech waveform,
wherein the attribute values include power and phoneme duration of each item of phoneme data, and
said first penalty assigning means assigns a power-related penalty in such a manner that a small penalty is assigned to phoneme data whose power is close to an average value of the power, and assigns a phoneme-duration-related penalty in such a manner that a small penalty is assigned to phoneme data whose phoneme duration is close to an average value of the phoneme duration.
 2. (Original) The apparatus according to claim 1, wherein said storage means stores respective items of attribute information together with the plural items of phoneme data; and

said first penalty assigning means obtains an attribute value from the attribute information stored in said storage means.

3. (Original) The apparatus according to claim 2, wherein the attribute information includes phoneme environment, phoneme boundary, fundamental frequency, power and phoneme duration.

4. (Original) The apparatus according to claim 1, wherein said retrieval means retrieves phoneme data that satisfies a specified phoneme environment.

5. (Original) The apparatus according to claim 1, wherein said retrieval means retrieves phoneme data that satisfies a specified phoneme environment and fundamental frequency.

6. (Original) The apparatus according to claim 1, wherein said first penalty assigning means sorts retrieved phoneme data based upon a prescribed attribute value and assigns a penalty value on the basis of order obtained by sorting.

8. (Previously Amended) A speech synthesizing apparatus comprising:
storage means for storing plural items of phoneme data;
retrieval means for retrieving phoneme data, in accordance with given retrieval conditions, from the plural items of phoneme data stored in said storage means;
first penalty assigning means for assigning a penalty that is based upon an attribute value to each item of phoneme data retrieved by said retrieval means; and
selection means for selecting, from the phoneme data retrieved by said retrieval means, and based upon the penalty assigned by said first penalty assigning means, phoneme data to be employed in synthesis of a speech waveform,

wherein said first penalty assigning means:

sorts the items of phoneme data in order of decreasing power and assigns a power-related penalty on the basis of the order obtained by sorting, in such a manner that a small penalty is assigned to phoneme data whose power is close to an average value; and

sorts the items of phoneme data in order of decreasing phoneme duration and assigns a phoneme-duration-related penalty on the basis of the order obtained by sorting, in such a manner that a small penalty is assigned to phoneme data whose phoneme duration is close to an average value.

81 9. (Previously Amended) A speech synthesizing apparatus comprising:

storage means for storing plural items of phoneme data;

retrieval means for retrieving phoneme data, in accordance with given retrieval conditions, from the plural items of phoneme data stored in said storage means;

first penalty assigning means for assigning a penalty that is based upon an attribute value to each item of phoneme data retrieved by said retrieval means;

selection means for selecting, from the phoneme data retrieved by said retrieval means, and based upon the penalty assigned by said first penalty assigning means, phoneme data to be employed in synthesis of a speech waveform;

alternate retrieval means for retrieving phoneme data that satisfies some of the retrieval conditions in said retrieval means does not exist;

counting means for grouping phoneme data, which has been retrieved by said alternate retrieval means, on the basis of a phoneme environment, and counting the items of phoneme data on a per-group basis; and

second penalty assigning means for assigning a penalty on the basis of a count obtained by said counting means to the phoneme data retrieved by said alternate retrieval means,

this penalty being assigned in addition to the penalty assigned by said first penalty assigning means.

10. (Original) The apparatus according to claim 9, wherein the retrieval conditions include phoneme environment; and

said alternate retrieval means retrieves phoneme data which agrees with part of a phoneme environment specified in the retrieval conditions.

11. (Original) The apparatus according to claim 10, wherein the phoneme environment specified in the retrieval conditions is a triphone composed of an applicable phoneme and phonemes on both sides thereof; and

said alternate retrieval means retrieves phoneme data for which the applicable phoneme and its left side phoneme agree with the retrieval conditions, or phoneme data for which the applicable phoneme and its right side phoneme agree with the retrieval conditions.

12. (Previously Amended) A speech synthesizing method comprising:
a storage step of storing plural items of phoneme data;
a retrieval step of retrieving phoneme data, in accordance with given search retrieval conditions, from the plural items of phoneme data stored at said storage step;
a first penalty assigning step of assigning a penalty that is based upon an attribute value to each item of phoneme data retrieved at said retrieval step; and
a selection step of selecting, from the phoneme data retrieved at said retrieval step, and based upon the penalty assigned at said penalty assigning step, phoneme data employed in synthesis of a speech waveform,
wherein the attribute values include power and phoneme duration of each item of phoneme data, and

in the first penalty assigning step, a power-related penalty is assigned in such a manner that a small penalty is assigned to phoneme data whose power is close to an average value of the power, and a phoneme-duration-related penalty is assigned in such a manner that a small penalty is assigned to phoneme data whose phoneme duration is close to an average value of the phoneme duration.

13. (Original) The method according to claim 12, wherein said storage step stores respective items of attribute information together with the plural items of phoneme data;

and

said first penalty assigning step obtains an attribute value from the attribute information stored at said storage step.

14. (Original) The method according to claim 13, wherein the attribute information includes phoneme label, phoneme boundary, fundamental frequency, power and phoneme duration.

15. (Original) The method according to claim 12, wherein said retrieval step retrieves phoneme data that satisfies a specified phoneme environment.

16. (Original) The method according to claim 12, wherein said retrieval step retrieves phoneme data that satisfies a specified phoneme environment and fundamental frequency.

17. (Original) The method according to claim 12, wherein said first penalty assigning step sorts retrieved phoneme data based upon a prescribed attribute value and assigns a penalty value on the basis of order obtained by sorting.

19. (Previously Amended) A speech synthesizing method comprising:
a storage step of storing plural items of phoneme data;

a retrieval step of retrieving phoneme data, in accordance with given search retrieval conditions, from the plural items of phoneme data stored at said storage step;

a first penalty assigning step of assigning a penalty that is based upon an attribute value to each item of phoneme data retrieved at said retrieval step where a penalty is assigned using power and phoneme duration of each item of phoneme data as the attribute value; and

a selection step of selecting, from the phoneme data retrieved at said retrieval step, and based upon the penalty assigned at said penalty assigning step, phoneme data employed in synthesis of a speech waveform,

wherein said first penalty assigning step:

sorts the items of phoneme data in order of decreasing power and assigns a power-related penalty on the basis of the order obtained by sorting, in such a manner that a small penalty is assigned to phoneme data whose power is close to an average value; and

sorts the items of phoneme data in order of decreasing phoneme duration and assigns a phoneme-duration-related penalty on the basis of the order obtained by sorting, in such a manner that a small penalty is assigned to phoneme data whose phoneme duration is close to an average value.

20. (Previously Amended) A speech synthesizing method comprising:

a storage step of storing plural items of phoneme data;

a retrieval step of retrieving phoneme data, in accordance with given search retrieval conditions, from the plural items of phoneme data stored at said storage step;

a first penalty assigning step of assigning a penalty that is based upon an attribute value to each item of phoneme data retrieved at said retrieval step;

a selection step of selecting, from the phoneme data retrieved at said retrieval step, and based upon the penalty assigned at said penalty assigning step, phoneme data employed in synthesis of a speech waveform;

an alternate retrieval step of retrieving phoneme data that satisfied some of the retrieval conditions in a case where phoneme data that conforms to the retrieval conditions at said retrieval step does not exist;

a counting step of grouping phoneme data, which has been retrieved at said alternate retrieval step, on the basis on a phoneme environment, and counting the items of phoneme data on a per-group basis; and

51 a second penalty assigning step of assigning a penalty on the basis of a count obtained at said counting step to the phoneme data retrieved at said alternate retrieval step, this penalty being assigned in addition to the penalty assigned at said first penalty assigning step.

(21. (Original) The method according to claim 20, wherein the retrieval conditions include phoneme environment; and

said alternate retrieval step retrieves phoneme data which agrees with part of a phoneme environment specified in the retrieval conditions.

22. (Original) The method according to claim 21, wherein the phoneme environment specified in the retrieval conditions is a triphone compose of an applicable phoneme and phonemes on both sides thereof; an

said alternate retrieval means retrieves phoneme data for which the applicable phoneme and its left side phoneme agree with the retrieval conditions, or phoneme data for which the applicable phoneme and its right side phoneme agree with the retrieval conditions.

23. (Previously Amended) A storage medium storing a control program for causing a computer to execute speech synthesis using phoneme data, said control program having:

code of a storage step of storing plural items of phoneme data;

code of a retrieval step of retrieving phoneme data, in accordance with given search retrieval conditions, from the plural items of phoneme data stored at said storage step;

code of a first penalty assigning step of assigning a penalty that is based upon an attribute value to each item of phoneme data retrieved at said retrieval step; and

code of a selection step of selection, from the phoneme data retrieved at said retrieval step, and based upon the penalty assigned at said first penalty assigning step, phoneme data employed in synthesis of a speech waveform,

wherein the attribute values include power and phoneme duration of each item of phoneme data, and

in the first penalty assigning step, a power-related penalty is assigned in such a manner that a small penalty is assigned to phoneme data whose power is close to an average value of the power, and a phoneme-duration-related penalty is assigned in such a manner that a small penalty is assigned to phoneme data whose phoneme duration is close to an average value of the phoneme duration.

24. (Previously Amended) A storage medium storing a control program for causing a computer to execute speech synthesis using phoneme data, said control program having:

code of a storage step of storing plural items of phoneme data;

code of a retrieval step of retrieving phoneme data, in accordance with given search retrieval conditions, from the plural items of phoneme data stored at said storage step;

code of a first penalty assigning step of assigning a penalty that is based upon an attribute value to each item of phoneme data retrieved at said retrieval step;

code of a selection step of selection, from the phoneme data retrieved at said retrieval step, and based upon the penalty assigned at said first penalty assigning step, phoneme data employed in synthesis of a speech waveform;

code of an alternate retrieval step of retrieving phoneme data that satisfies some of the conditions in a case where phoneme data that conforms to the retrieval conditions at said retrieval step does not exist;

code of a counting step of grouping phoneme data, which has been retrieved at said alternate retrieval step, on the basis of a phoneme environment, and counting the items of phoneme data on a per-group basis; and

code of a second penalty assigning step of assigning a penalty on the basis of a count obtained at said counting step to the phoneme data retrieved at said alternate retrieval step, this penalty being assigned in addition to the penalty assigned at said first penalty assigning step.

25. **(Currently Amended)** A speech synthesizing apparatus comprising:

storage means for storing plural items of phoneme data,

wherein each item of phoneme data includes an attribute value for phoneme environment, phoneme boundary and fundamental frequency, power and phoneme duration;

retrieval means for retrieving phoneme data ~~having identical phoneme environments and fundamental frequencies~~ from the plural items of phoneme data stored in said storage means;

~~first~~ penalty assigning means for sorting the phoneme data retrieved by said retrieving means based upon a prescribed attribute value and for assigning a penalty ~~that is based upon an attribute value~~ to each item of the phoneme data on the basis of order obtained by sorting so that larger penalty is added to the phoneme whose order is near the smallest and biggest and smaller penalty is added to the phonemes whose order is near the middle; and

selection means for selecting, from the phoneme data retrieved by said retrieval means, and based upon the penalty assigned by ~~said~~ a first penalty assigning means, phoneme data to be employed in synthesis of a speech waveform.

26. **(Currently Amended)** A speech synthesizing method comprising:

a storage step of storing plural items of phoneme data,

wherein each item of phoneme data includes an attribute value for phoneme environment, phoneme boundary and fundamental frequency, power and phoneme duration;

a retrieval step of retrieving phoneme data ~~having identical phoneme environments and fundamental frequencies~~ from the plural items of phoneme data stored at said storage step;

a ~~first~~ penalty assigning step of sorting the phoneme data retrieved at said retrieving step based upon a prescribed attribute value and of assigning a penalty ~~that is based upon an attribute value~~ to each item of the phoneme data on the basis of order obtained by sorting so that larger penalty is added to the phoneme whose order is near the smallest and biggest and smaller penalty is added to the phoneme whose order is near the middle; and

a selection step of selecting, from the phoneme data retrieved at said retrieval step, and based upon the penalty assigned at ~~said~~ a first penalty assigning step, phoneme data employed in synthesis of a speech waveform.

27. (Currently Amended) A storage medium storing a control program for causing a computer to execute speech synthesis using phoneme data, said control program having:

code of a storage step of storing plural items of phoneme data,

wherein each item of phoneme data includes an attribute value for phoneme environment, phoneme boundary and fundamental frequency, power and phoneme duration;

code of a retrieval step of retrieving phoneme data ~~having identical phoneme environments and fundamental frequencies~~ from the plural items of phoneme data stored at said storage step;

code of a ~~first~~ penalty assigning step of sorting the phoneme data retrieved at said retrieving step based upon a prescribed attribute value and of assigning a penalty ~~that is based upon an attribute value~~ to each item of the phoneme data on the basis of order obtained by sorting so that larger penalty is added to the phoneme whose order is near the smallest and biggest and smaller penalty is added to the phoneme whose order is near the middle; and

code of a selection step of selecting, from the phoneme data retrieved at said retrieval step, and based upon the penalty assigned at said a first penalty assigning step, phoneme data employed in synthesis of a speech waveform.

28. (Previously Amended) A speech synthesizing apparatus comprising:
storage means for storing plural items of phoneme data;
retrieval means for retrieving phoneme data, in accordance with given retrieval conditions, from the plural items of phoneme data stored in said storage means;

penalty assigning means for assigning a penalty to each of the plural items of phoneme data so as to raise the possibility that phoneme data whose value of a predetermined attribute is close to an average value of the predetermined attribute, is selected; and

selection means for selecting, from the phoneme data retrieved by said retrieval means, and based upon the penalty assigned by said penalty assigning means, phoneme data to be employed in synthesis of a speech waveform.

29. (Previously Amended) The apparatus according to claim 28, wherein said penalty assigning means assigns a penalty in such a manner that a small penalty is assigned to a phoneme data whose value of the predetermined attribute is close to the average value, and a large penalty is assigned to a phoneme data whose value of the predetermined attribute is far from the average value.

30. (Previously Amended) A speech synthesizing method comprising:
a storage step of storing plural items of phoneme data;
a retrieval step of retrieving phoneme data, in accordance with given search retrieval conditions, from the plural items of phoneme data stored at said storage step;

a penalty assigning step of assigning a penalty to each of the plural items of phoneme data so as to raise the possibility that phoneme data whose value of a predetermined attribute is close to an average value of the predetermined attribute, is selected; and

a selection step of selecting, from the phoneme data retrieved at said retrieval step, and based upon the penalty assigned at said penalty assigning step, phoneme data employed in synthesis of a speech waveform.

31. (Previously Amended) The method according to claim 30, wherein the penalty assigning step assigns a penalty in such a manner that a small penalty is assigned to a

phoneme data whose value of the predetermined attribute is close to the average value, and a large penalty is assigned to a phoneme data whose value of the predetermined attribute is far from the average value.

32. (Previously Amended) A storage medium storing a control program for causing a computer to execute speech synthesis using phoneme data, said control program having:

code of a storage step of storing plural items of phoneme data;

E code of a retrieval step of retrieving phoneme data, in accordance with given search retrieval conditions, from the plural items of phoneme data stored at said storage step;

code of a penalty assigning step of assigning a penalty to each of the plural items of phoneme data so as to raise the possibility that phoneme data whose value of a predetermined attribute is close to an average value of the predetermined attribute, is selected; and

code of a selection step of selecting, from the phoneme data retrieved at said retrieval step, and based upon the penalty assigned at said penalty assigning step, phoneme data employed in synthesis of a speech waveform.
